

AMENDMENTS TO THE DRAWINGS

The attached sheet of a drawing includes changes to Figure 1 .

Attachment: Replacement sheet

REMARKS

Claims 1 and 4 are pending in the present application. Claims 2, 3 and 5 have been cancelled. Claims 1 and 4 have been amended by incorporating the subject matter of claim 3. No new matter has been added by way of the above amendments.

In the Specification

The title has been amended as suggested by the Examiner and should now be more descriptive of the invention.

Drawings

A corrected drawing is submitted herewith which shows every feature of the invention as specified in the claims. No new matter has been added by this amendment.

Issues under 35 USC § 112

Claim 2 has been rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. Claim 2 has now been cancelled, thereby removing the rejection.

Claims 1-5 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Regarding claim 1, Applicants have amended the claim according to the Examiner's suggestion. Therefore, Applicants request that the rejection be withdrawn as to claim 1.

Regarding claim 4, Applicants have now amended the claim to set forth the steps whereby a silica-aluminum based inorganic polymer flocculant is produced from a silica sol and

aluminum sulfate. Accordingly, since the claim is no longer indefinite, Applicants request that the rejection be withdrawn as to claim 4. Claims 2, 3 and 5 have been cancelled.

Issues under 35 USC § 101

Claims 4 and 5 have been rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process. Claim 4, as amended, now recites the steps used in the process. Claim 5 has been cancelled. Therefore, Applicants request that this rejection be withdrawn.

Issues under 35 USC § 102

Claim 4 has been rejected under 35 U.S.C. 102(b) as being anticipated by “Study on the treatment of papermaking wastewater by polymeric aluminum sulfate silicate” (herein referred to as “CHINA”). Applicants respectfully traverse this rejection. Reconsideration and withdrawal thereof are requested.

The process of the invention, as recited in claim 4, is directed to a method for producing a silica-aluminum based inorganic polymer flocculant, comprising:

- (a) reacting a sodium silicate solution with a halogen-free mineral acid to produce silica sol; and
- (b) adding aluminum sulfate to the silica sol to produce a silica-aluminum based inorganic polymer flocculant.

The a silica-aluminum based inorganic polymer flocculant produced has an Si/Al molar ratio of 0.2 to 1.5, a pH of 1.5 to 2.5 and an SiO₂ concentration of 5 to 25 g/L. The silica sol produced in step (a) can be further used as a retention aid for improving papermaking productivity.

Applicants have discovered that when papermaking waste water having a pH of 5 to 14 is to be treated, the pH can be easily adjusted to within an acidic range by adding an acidic inorganic polymer flocculant thereby reducing the pH of the papermaking waste water to 5 to 8 . Additionally, according to studies conducted by the inventors of the present invention, it has

been found that if the pH of the papermaking waste water is not reduced to 5 to 8 by the addition of an inorganic polymer flocculant, then the turbidity of the papermaking waste water cannot be fully reduced even when an organic polymer flocculant is added. According to Applicants' invention, a silica-aluminum based inorganic polymer flocculant is produced which has a pH of 1.5 to 2.5. When this flocculant is used to treat papermaking waste water having a pH of 5 to 14, advantageous results are obtained which are not seen when using the alkaline inorganic flocculant of CHINA.

In CHINA, under the heading "1.2 Preparation of PASS solution" there is described a method for the manufacture of an inorganic polymer flocculant. The term "PASS" represents polymeric aluminum sulfate silicate. First, the method of CHINA adds sulfuric acid to an aqueous solution of sodium silicate in order to adjust the pH of the aqueous sodium silicate. Part of the sodium silicate is neutralized to precipitate the primary particles of silica. The silica is polymerized to the extent that it does not gel over time. Then, a predetermined amount of aluminum sulfate is added, and the resulting product is aged for 2 hours to produce a flocculant.

In general, when a neutralization reaction occurs between sodium silicate and an acid (such as sulfuric acid), a sodium salt, such as Na_2SO_4 , is produced. The gelation time is shortest when this occurs in a neutral environment (pH of 7 to 10). When sulfuric acid is added to the aqueous solution of sodium silicate as described in CHINA, Na_2SO_4 (sodium salt) appears to exist in the reaction system. This is further explained in the Declaration under 37 CFR 1.132 enclosed herewith by Mr. Kazuhiko Munemasa, one of the inventors of the present invention. See Fig. 2.2.4 of "Inorganic Polymer - Application of Hybrid Polymer" published by CMC on January 30, 1985.

Applicants have found that when following the method of CHINA by adding sulfuric acid to an alkaline aqueous solution of sodium silicate in order to reduce the pH of the aqueous solution to 10 or less, the silica sol gelled instantly to become an aggregate. When sulfuric acid was added to this aggregate continuously, it still did not dissolve the gelled aggregate, and ultimately acidic silica sol could not be obtained. Additionally, since the product produced by the method of CHINA is in gel form, it is not the proper medium for use in the treatment of papermaking waste water. As Applicants further describe in the Declaration, when the pH is less

than 11, the silica is aggregated and gelled simply upon stirring and mixing, and therefore the silica does not exist as an aqueous solution.

Furthermore, the process of CHINA does not produce an acidic silica-aluminum based inorganic polymer flocculant as in Applicants' present invention since the sodium salt is present in the reaction system of CHINA. Instead, the silica sol produced in the first step of CHINA is alkaline. It follows then that the resulting inorganic polymer flocculant obtained by adding aluminum sulfate to this silica sol must also be alkaline. Applicants believe that the reason why the process of the present invention produces an inorganic polymer flocculant having a pH of 1.5 to 2.5 (acidic) is due to Applicants' method of manufacturing silica sol in step (a).

Since the inorganic polymer flocculant of CHINA is alkaline and not acidic (pH of 1.5 to 2.5) as Applicants claim in claim 4, then the description of CHINA fails to anticipate the present invention. Accordingly, Applicants request that the rejection under 35 USC § 102(b) be withdrawn.

Issues under 35 USC § 103

Claims 1 and 2 have been rejected under 35 U.S.C. 103 as being obvious over Takahashi (JP 5302291) in view of CHINA. Applicants respectfully traverse this rejection. Reconsideration and withdrawal thereof are requested.

Takahashi describes a method for treating papermaking waste water. In the method of Takahashi, the pH of the papermaking waste water is first adjusted to 4 to 6. Then, a polyvalent metal salt is added, and the pH is adjusted to 5 to 7 by use of an alkali. Finally, an organic polymer flocculant is added. Takahashi fails to teach the use of a silica-aluminum based inorganic polymer flocculant as Applicants claim. To overcome this deficiency, the rejection relies on CHINA since CHINA describes a silica-aluminum flocculant for treating waste water.

However, the basis of the rejection relies on the false assumption that the skilled artisan would recognize an equivalence between these two types of flocculants. As Applicants have explained above and demonstrated in the Declaration, the inorganic polymer flocculant of CHINA is alkaline. By contrast, the polyvalent metal salt used in Takahashi is an acidic compound, such as an aluminum salt. One of ordinary skill in the art would readily recognize,

especially in this pH-sensitive art, that the alkaline flocculant of CHINA is neither interchangeable with nor equivalent to the acidic flocculant of Takahashi. If the skilled artisan was to use the alkaline silica-aluminum flocculant of CHINA in the method of Takahashi, the pH of the solution would be altered to such an extent that the remaining steps of the Takahashi method would fail to produce the desired results.

Accordingly, since one of ordinary skill in the art would not be motivated to substitute the alkaline flocculant of CHINA for the acidic flocculant used in the papermaking waste water treatment method of Takahashi with any expectation of success, Applicants assert that the rejection of the claims as being obvious over Takahashi in view of CHINA is improper. Applicants respectfully request that this rejection be withdrawn.

Claims 1 and 2 have been rejected over CHINA and Früh (WO/03/029151). Applicants respectfully traverse this rejection. Reconsideration and withdrawal thereof are requested.

CHINA fails to teach the addition of an organic polymer after the addition of the silica-aluminum based inorganic polymer flocculant. To correct this deficiency, the rejection relies on Früh to teach the addition of this step. In the flocculant composition of Früh, the inorganic and organic polymers are combined and then added to the waste water. The rejection cites MPEP 2144.04 (IV)(C) to support the position that changing the sequence of the addition of components is an obvious modification. However, changing the sequence of steps for adding two components is not the same as combining the two addition steps of those two components into one addition step. If the skilled artisan were to combine the alkaline flocculant of CHINA with the organic flocculant of Früh, the resulting composition would still fall short of being an obvious variation of the acidic flocculant instantly claimed by Applicants. Thus, even if the skilled artisan were motivated to combine the inorganic and organic flocculants according to Früh, which Applicants do not concede, such a combination step does not correct the deficiency of CHINA as a primary reference since the inorganic flocculant of CHINA is alkaline and not acidic, as Applicants claim. Since a *prima facie* case of obviousness has not been established, Applicants respectfully request that this rejection be withdrawn.

Claims 3 and 4 have been rejected over Takahashi in view of CHINA, and optionally further in view of Koga (2003/0019815). Claims 3 and 4 have been rejected over CHINA and Früh, optionally further in view of Koga. Applicants respectfully traverse these rejections. Reconsideration and withdrawal thereof are requested.

The rejection asserts that even without the teaching of Koga, the combined disclosures of Takahashi and CHINA or the combined disclosures of CHINA and Früh would teach the skilled artisan that the adjusted pH and SiO₂ concentrations are result effective variables which could be optimized to obtain improved performance. However, CHINA does not disclose or even suggest that the pH could or should be adjusted to a value within the range of 1.5 to 2.5, which is the range of pH values for the inorganic flocculant of the instant invention. Applicants have provided evidence that the addition of sulfuric acid beyond that suggested in CHINA (the equivalent to “optimizing” the pH) causes the silica to gel and become ineffective for its intended purpose. Additionally, even if it is assumed that CHINA teaches these variable values to be critical, the skilled artisan is not guided towards an end result for which these values are to be optimized. Nor would the skilled artisan expect that adjusting the pH into the acidic range after the fact to be equivalent to initially producing an acidic flocculant. According to CHINA, the skilled artisan would only expect the Al/SiO₂ ratio to be the value to be optimized since varying that value leads to variations in the coagulating effect as described and exemplified therein. The skilled artisan is not given any guidance as to how or to what extent the pH should be adjusted.

The Examiner cites Koga to supplement the teachings of Takahashi, Früh and CHINA by allegedly showing that the pH values and SiO₂ concentrations are known in the art. Koga is directed to a process for preparing a flocculant for water treatment (not waste water treatment), and further differs from the present invention by disclosing silica sol inorganic polymers as opposed to a silica sol aluminum mixture inorganic polymer as claimed. And while the inorganic polymer flocculants of Koga are acidic, the skilled artisan would not be motivated to substitute the Koga flocculants with those of CHINA since the flocculants of CHINA are alkaline. Those skilled in this pH-sensitive art would appreciate that such a substitution would drastically change the product and results. This is further supported by the fact that when the

inorganic polymer flocculants of Koga contain aluminum, the Si/Al molar ratio of the flocculant is from 2.5 to 15 (see paragraph [0045] of Koga). This is outside the scope of the claimed invention which recites a Si/Al molar ratio in the range of 0.2 to 1.5.

Each of CHINA, Takahashi, Früh and Koga differ from the invention in significant aspects as described above. If the skilled artisan were to combine any of these references, not only would the combination destroy the intended benefit and result of the references individually, but the combination would also fail to make Applicants invention obvious. Accordingly, Applicants assert that the only motivation for combining these references is based on hindsight gleaned from Applicants' own invention. "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983).

Inasmuch as CHINA, Takahashi, Früh and Koga individually and in combination do not make the claimed invention *prima facie* obvious for the reasons set forth above, the rejection of the claims under 35 U.S.C. 103(a) over these references should be withdrawn.

Claim 5 is rejected over CHINA, optionally in view of Koga. Applicants respectfully traverse this rejection. Reconsideration and withdrawal thereof are requested since claim 5 has now been cancelled.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Marc S. Weiner, Reg. No. 32,181 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By Marc S. Weiner (Reg. No. 32,181)

Marc S. Weiner

Registration No.: 32,181

BIRCH, STEWART, KOLASCH & BIRCH, LLP

8110 Gatehouse Road

Suite 100 East

P.O. Box 747

Falls Church, Virginia 22040-0747

(703) 205-8000

Attorney for Applicant

Attachments: Executed Declaration of Mr. Kazuhiko Munemasa
Replacement Drawing of Figure 1